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Sr/Ca ratios in cold-water corals - a 'low-resolution' temperature archive?

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One of the basic data to understand global change and past global changes is the measurement and the reconstruction of temperature of marine water masses. E.g. seawater temperature controls the density of seawater and in combination with salinity is the major driving force for the oceans circulation system. Geochemical investigations on cold-water corals *Lophelia pertusa* and *Desmophyllum cristagalli* indicated the potential of these organisms as high-resolution archives of environmental parameters from intermediate and deeper water masses (Adkins and Boyle 1997). Some studies tried to use cold-water corals as a high-resolution archive of temperature and salinity (Smith et al. 2000, 2002; Blamart et al. 2005; Lutringer et al. 2005). However, the fractionation of stable isotopes ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) and element ratios (Sr/Ca, Mg/Ca, U/Ca) are strongly influenced by vital effects (Shirai et al. 2005; Cohen et al. 2006), and difficult to interpret. Nevertheless, ongoing studies indicate the potential of a predominant temperature dependent fractionation of distinct isotopes and elements (e.g. Li/Ca, Montagna et al. 2008; U/Ca, Mg/Ca, $\delta^{18}\text{O}$, López Correa et al. 2008; $\delta^{88/86}\text{Sr}$, Rüggeberg et al. 2008).

Within the frame of DFG-Project TRISTAN and Paläo-TRISTAN (Du 129/37-2 and 37-3) we investigated live-collected specimens of cold-water coral *L. pertusa* from all along the European continental margin (Northern and mid Norwegian shelves, Skagerrak, Rockall and Porcupine Bank, Galicia Bank, Gulf of Cadiz, Mediterranean Sea). These coral samples grew in waters characterized by temperatures between 6°C and 14°C. Electron Microprobe investigations along the growth direction of individual coral polyps were applied to determine the relationship between the incorporation of distinct elements (Sr, Ca, Mg, S). Cohen et al. (2006) showed for *L. pertusa* from the Kosterfjord, Skagerrak, that ~25% of the coral's Sr/Ca ratio is related to temperature, while 75% are influenced by the calcification rate of the organism. However, the Sr/Ca-temperature relation of our *L. pertusa* specimens suggest, that mean values are more reliable for temperature reconstruction along a larger temperature range than local high-resolution investigations. Additionally, our results plot on same line of Sr/Ca-temperature relationship like tropical corals indicating a similar behaviour of element incorporation during calcification.

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